

**TABLE E-1**  
**SOIL INVERTEBRATE TOXICITY REFERENCE VALUES**

Constituent	Basis for Toxicity Reference Value (TRV)				TRV <sup>c</sup>	Reference and Explanation <sup>d</sup>
	Duration and Endpoint <sup>a</sup>	Test Species	Concentration	Uncertainty Factor <sup>b</sup>		
<b>Dioxins and furans (Φg/kg)</b>						
2,3,7,8-TCDD (compare to 2,3,7,8-TCDD toxicity equivalence concentration)	Chronic (85-day); no mortality reported at 5,000 Φg/kg	Earthworm ( <i>Allolobophora caliginosa</i> )	5,000	0.1 <sup>e</sup>	500	Toxicity value for 2,3,7,8-TCDD (Reinecke and Nash 1984). UF applied to concentration because mortality only endpoint available and data not subjected to statistical analysis.
<b>Polycyclic aromatic hydrocarbons (PAH) (Φg/kg)</b>						
Total high molecular weight (HMW) PAH	Not available	--	--	--	25,000	Benzo(a) pyrene used as surrogate for HMW PAH compounds.
Benzo(a)pyrene	Chronic (28-day) NOAEL for growth	Woodlouse ( <i>Porcellio scaber</i> )	25,000	Not applicable	25,000	van Straalen and Verweij (1991).
Benzo(a)anthracene	Not available	--	--	--	25,000	Screening or toxicity value not available. TRV for benzo(a)pyrene used as surrogate.
Benzo(b)fluoranthene	Not available	--	--	--	25,000	Screening or toxicity value not available. TRV for benzo(a)pyrene used as surrogate.
Benzo(k)fluoranthene	Not available	--	--	--	25,000	Screening or toxicity value not available. TRV for benzo(a)pyrene used as surrogate.

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Chrysene	Not available	--	--	--	25,000	Screening or toxicity value not available. TRV for benzo(a)pyrene used as surrogate.
Dibenz(a,h)anthracene	Not available	--	--	--	25,000	Screening or toxicity value not available. TRV for benzo(a)pyrene used as surrogate.
Indeno(1,2,3-cd)pyrene	Not available	--	--	--	25,000	Screening or toxicity value not available. TRV for benzo(a)pyrene used as surrogate.
<b>Polychlorinated biphenyls (PCB) (<math>\mu\text{g}/\text{kg}</math>)</b>						
Aroclor 1016	Acute median lethal concentration (LC50)	Earthworm	251,000	0.01	2,510	Rhett and others (1989).
Aroclor 1254	Acute median lethal concentration (LC50)	Earthworm	251,000	0.01	2,510	Rhett and others (1989).
<b>Nitroaromatics (<math>\mu\text{g}/\text{kg}</math>)</b>						
1,3-Dinitrobenzene	--	--	--	--	2,260	Screening or toxicity value not available. Nitrobenzene used as surrogate.

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2,4-Dinitrotoluene	--	--	--	--	--	Screening or toxicity value not available.
2,6-Dinitrotoluene	--	--	--	--	--	Screening or toxicity value not available.
Nitrobenzene	Subchronic (14-day) LC50	Earthworm (species uncertain)	226,000	0.01 <sup>e</sup>	2,260	Neuhauser and others (1986).
Pentachloronitrobenzene	--	--	--	--		Screening or toxicity value not available.
2,4,6-Trinitrotoluene	--	--	--	--	--	Screening or toxicity value not available.
<b>Phthalate esters (µg/kg)</b>						
Bis(2-ethylhexyl)phthalate	--	--	--	--	--	Screening or toxicity value not available.
Di-n-butylphthalate	--	--	--	--	--	Screening or toxicity value not available.
Diethylphthalate	--	--	--	--	--	Screening or toxicity value not available.
Di(n)octyl phthalate	--	--	--	--	--	Screening or toxicity value not available.

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<b>Volatile organic compounds (µg/kg)</b>						
Acetone	--	--	--	--	--	Screening or toxicity value not available.
Acrylonitrile	--	--	--	--	--	Screening or toxicity value not available.
Bromoform	--	--	--	--	--	Screening or toxicity value not available.
Chloroform	--	--	--	--	--	Screening or toxicity value not available.
Crotonaldehyde	--	--	--	--	--	Screening or toxicity value not available.
1,4-Dioxane	--	--	--	--	--	Screening or toxicity value not available.
Ethylbenzene	--	--	--	--	--	Screening or toxicity value not available.
n-Hexane	--	--	--	--	--	Screening or toxicity value not available.
Formaldehyde	--	--	--	--	--	Screening or toxicity value not available.
1,1,2,2-Tetrachloroethane	--	--	--	--	--	Screening or toxicity value not available.

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Vinyl chloride	--	--	--	--	--	Screening or toxicity value not available.
<b>Semi-volatile organic compounds (Φg/kg)</b>						
Benzoic acid	--	--	--	--	--	Screening or toxicity value not available.
Benzyl alcohol	--	--	--	--	--	Screening or toxicity value not available.
<b>Inorganics (mg/kg)</b>						
Aluminum	--	--	--	--	--	Screening or toxicity value not available.
Antimony	--	--	--	--	--	Screening or toxicity value not available.
Arsenic	Chronic (56-day); reduced cocoon production reported at single concentration tested	Earthworm ( <i>Eisenia fetida</i> )	68	0.01 <sup>e</sup>	0.68	Fischer and Koszorus (1992).
Barium	--	--	--	--	--	Screening or toxicity value not available.

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Beryllium	--	--	--	--	--	Screening or toxicity value not available.
Boron	--	--	--	--	--	Screening or toxicity value not available.
Cadmium	Chronic (4-month) NOAEL for cocoon production	Earthworm <i>(Dendrobaena rubida)</i>	10	Not applicable	10	Bengtsson and others (1986).
Chromium (hexavalent)	Chronic (60-day); survival reduced 25 percent at lowest tested concentration	Earthworm <i>(Octochaetus pattoni)</i>	2	0.1 <sup>e</sup>	0.2	Abbasi and Soni (1983).
Copper	Chronic (56-day) NOAEL for cocoon production	Earthworm <i>(Eisenia fetida)</i>	32.0	Not applicable	32.0	Spurgeon and others (1994).
Cyanide, total	--	--	--	--	--	Screening or toxicity value not available.
Lead	Chronic (4-month) NOAEL for cocoon production	Earthworm <i>(Dendrobaena rubida)</i>	100	Not applicable	100	Bengtsson and others 1986.

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	Duration and Endpoint <sup>a</sup>	Test Species	Concentration	Uncertainty Factor <sup>b</sup>		
Mercury	Chronic (60-day); cocoon production reduced 40 percent at lowest tested concentration ( $\text{Hg}^{2+}$ )	Earthworm ( <i>Octochaetus pattoni</i> )	0.5	0.1	0.05	Abbasi and Soni (1983).
Methyl mercury	Chronic (12-week) NOAEL for segment regeneration	Earthworm ( <i>Eisenia foetida</i> )	2.5	0.1 <sup>e</sup>	0.25	Beyer, Cromartie, and Moment (1985). Wet weight NOAEL of 1 mg/kg converted to corresponding dry weight NOAEL based on 60 percent moisture content. Uncertainty factor of 0.1 used because segment regeneration may not be a sensitive endpoint.
Nickel	Chronic (20-week) NOAEL for cocoon production	Earthworm ( <i>Eisenia foetida</i> )	100	Not applicable	100	Malecki and others (1982).
Selenium	Chronic; reduced cocoon production at single tested concentration	Earthworm ( <i>Eisenia foetida</i> )	77	0.1 <sup>e</sup>	7.7	Fischer and Koszorus (1992).

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Silver	--	--	--	--	--	Screening or toxicity value not available.
Thallium	--	--	--	--	--	Screening or toxicity value not available.
Zinc	--	--	--	--	--	Screening or toxicity value not available.
<b>Other compounds (mg/kg)</b>						
Cyclotrinitramine-methylene (RDX)	--	--	--	--	--	Screening or toxicity value not available.
Decane	--	--	--	--	--	Screening or toxicity value not available.
GB (Sarin)	--	--	--	--	--	Screening or toxicity value not available.
VX	--	--	--	--	--	Screening or toxicity value not available.
Sulfur mustard	--	--	--	--	--	Screening or toxicity value not available.

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Notes:

- a To evaluate exposure duration, the following general guidelines were used: Chronic duration represents exposures occurring about 10 or more days, including exposure during a critical life stage encompassing a sensitive endpoint. Subchronic duration generally lasts 2 days through several days, however a sensitive life stage is not exposed. Acute duration generally includes exposures from 0 to 2 days.
  - b Uncertainty factors are used to extrapolate a toxicity value to a chronic NOAEL TRV.
  - c TRV was calculated by multiplying the regulatory or toxicity value with the uncertainty factor.
  - d The references refer to the source of the regulatory or toxicity value. Complete reference citations are provided at the end of this appendix.
  - e Best professional judgment used to identify uncertainty factor. Factors evaluated include test duration, ecological relevance of measured effect, experimental design, and availability of toxicity data.
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